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Gender-Bias in Intrahousehold Allocation : The Importance of Household Fixed Effects*

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ABSTRACT:

This paper presents an analysis of gender patterns in intra-household allocation of resources based on household level consumption data. Invoking the assumption that households seek to equalize the marginal utility of expenditures when they allocate resources over the life-cycle, the paper provides a rationale for parental behaviour pertaining to the intertemporal allocation of goods among children. Estimation results based on panel data from India show that controlling for the unobserved household fixed effects is of crucial importance. Once allowance is made for fixed effects, the results indicate that there is no gender-bias in the allocation of resources.

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1. Introduction

The allocation of resources within the household has become an important research issue in recent years. Any analysis of the distribution of income across households could present a wrong picture if there are inequalities in the distribution of resources within households. There is considerable evidence that resources are not allocated randomly within households, and that the distribution of resources, pecuniary as well as non-pecuniary, is unequal within the family. Such an unequal distribution of goods usually takes the form of a bias against females or children, especially in some poor countries. There is a rich literature on the existence of gender-bias in different parts of the world, including Africa, Asia, and Latin America. In India, for example, mortality rates and other anthropometric outcomes indicate that there is a bias against girls in the intra-household allocation of food (Bardhan(1984); Behrman(1988); Harriss(1990); Rosenzweig and Schultz(1982); Sen(1984); Sen and Sengupta(1983))[1].

While the evaluation of the standard of living of a household as a unit can be done on the basis of household-level data, the measurement of the welfare of each individual within a household poses a difficult problem since household surveys do not usually provide any information on the consumption of each individual. Further, it is problematic to assign a particular level of consumption to each individual since many commodities are consumed jointly within the household. In the case of food, there are many nutrition surveys[2] that collect data on individual intakes based on 24-hour recall information. Such surveys, however, do not collect data on other goods at an individual level. Almost all the studies on gender-bias in intra-household allocation are based on nutrition surveys; only a few studies[3]

look at household level consumption expenditure data to examine the presence, or absence, of inequalities within the household.

The goals of this paper are two-fold. First, to determine the pattern of intra-household allocation by looking only at household level consumption data. Second, to look for a rationale, within the framework of the modern approach to intertemporal allocation, as to why parents may discriminate between male and female children in the intra-household allocation of resources, in some countries or settings. For this purpose, I use a unique panel of consumption data from India.

My approach is to estimate several Engel curves to test for the effects of gender on consumption patterns. In a typical Engel curve relationship, total household expenditure is held constant. Under this method, it is possible to test for the impact of gender only on the composition of demand. For example, if we take two households with the same total outlay to spend, then only the composition of demand can change with the gender-composition of the household (since total expenditure, or outlay, is held constant, spending less on one good means more expenditure on some other good). Therefore I estimate equations in which total household income is included as a major explanatory variable instead of total household expenditures. This could capture any gender-bias in intra-household allocation that comes from parental consumption and saving behaviour following the birth of a child. For example, if the child born is a girl, then parents may start a life-cycle savings plan in order to meet marriage expenses[4] at a later date. In such cases, the presence of an additional girl in the household may lead to a reduction in total household expenditure (conditional on total household income) and also to a reduction in its major component, food expenditure.

The cross-section Engel curve equations with household income as the main explanatory variable indicate that male children receive more resources than female children in the case of food, with the result more pronounced for young male children. These cross-section equations are useful only for determining the pattern of intra-household allocation. In order to model the parental behaviour, as outlined above, pertaining to the intertemporal allocation of resources within the household, I control for household specific fixed effects utilizing the panel nature of the data. The bias in favour of male children, which is indicated by the cross-section results, vanishes when household fixed effects are controlled.

Existing studies of the intra-household allocation of goods use models in which the allocation is determined in one of the following four ways: (i) parents allocate resources based on the differential labour market returns to boys and girls (Rosenzweig and Schultz(1982), Sen and Sengupta(1983)); (ii) parents allocate resources according to their own utility, which depends on the well-being of their children (an approach due to Behrman, Pollak and Taubman(1982), Behrman(1988)); (iii) households allocate resources based on the productivity of individual members (Pitt, Rosenzweig and Hassan(1990)); (iv) resources are allocated according to the relative bargaining power of the family members (Haddad and Hoddinott(1991) and Thomas(1990)). This paper belongs to (i) above, in that parents allocate resources to male and female children in a pure investment sense.

The following section provides an outline of the model and the estimation procedure. In Section 3, I provide a description of the data used in this paper. Section 4 presents the estimation results. Section 5 summarizes the findings.

2. Model and Estimation Procedure

Modern theories of intertemporal allocation assume that individuals attempt to keep their marginal utility of expenditures constant[5] over time. This assumption could offer an intuitive and plausible explanation for parental economic behaviour in allocating resources over time, as children come into (through birth) and leave the household. Parents may favour male children over female children in some social and cultural settings, India for example, because of several factors: economic contributions made by female children may be considerably less than that made by male children to the household.

In many countries, labour market opportunities are limited for women[6]. Yet another important factor could be marriage-related financial commitments that daughters impose on their parents without any tangible returns[7]. In such contexts parents may optimally allocate the limited resources available, based on a cost-benefit calculation. Or, to put it differently, parents may view daughters as a drain on their wealth. If that is the case, a preponderance of female children will take the form of a wealth-effect: girls will increase parental marginal utility of lifetime wealth, because they may potentially reduce their parents' wealth as a result of the above factors. Then, in a utility maximizing framework, parents may be induced to reduce household expenditures following the birth of a female child. They may allocate more resources to boys (because, marginal utility is low) and fewer to girls, since they want to keep their marginal utility of expenditures constant over time.

To analyze the relationship between the gender composition and consumption patterns of households, I start from the general equation for an Engel curve

$$C_{ht} = f(X_{ht}, a_{ht}, Z_h, \alpha_h, U_{ht}) \qquad (1)$$

where C_{ht} is household consumption expenditure at time t, X_{ht} is total household income, a_{ht} is a vector of household demographic composition and age variables, Z_h is a vector of time-invariant control variables, U_{ht} is the standard error term, and α_h is an unobserved household-specific fixed effect.

Under the assumption of constant marginal utility, the specification above shows an elegant way to formalize the process of intra-household allocation. The household fixed effect, α_h, can be visualized as the unobserved marginal utility of household expenditures. Under such a specification, without controlling for the household specific fixed effect, one would expect to see differential gender effects on household consumption expenditures. However, once the unobserved effect is controlled for, there should not be any differences in parental allocative behaviour between male and female children.

In order to test the above hypothesis, I estimate a levels-version and a fixed-effects version of equation (1). To be more specific, I estimate equations of the following form:

$$C_{ht} = \alpha_h + \beta X_{ht} + \tau a_{ht} + \delta Z_h + U_{ht} \qquad (2)$$

where C_{ht} is the log of consumption expenditure and X_{ht} is the log of household income. I follow the within-estimator approach[8] to control for the unobserved fixed effect. Both the levels and the fixed effects estimates are obtained using ordinary least squares.

3. Data

The data used in the study come from the ICRISAT VLS (International Crops Research Institute for the Semi-Arid Tropics Village Level Studies) Panel Data set. These data come from a survey initiated by ICRISAT in 1975 in three distinct agroclimatic regions of semi-arid tropical India. The data set contains information on consumption, income and production for 120 continuous households from three villages (two from the State of Maharashtra and one from the State of Andhra Pradesh) for a period of ten years from 1975-84. Within each village, a random sample of 40 households (ten labour households and thirty cultivating households) was chosen for the panel. ICRISAT also conducted four rounds of a nutrition survey in the study villages during 1976-78. I use the data pertaining to the period 1976-81, because in 1976 the definition of food consumption was changed and consumption data were not collected in detail[9] after 1981.

Table 1 presents some descriptive statistics for the variables used in estimation. I use the food price index to deflate nominal food expenditures and the general price index to obtain real income and real total expenditures. The share of food in total expenditure is around 70% for all the three villages. The 6-year standard deviation in household food expenditures is proportionately less than that in household incomes. The average household size is 6, and the average total number of children (age 0-15) is 2.5.

4. Results and Analysis

In this section, results from the estimation of (2) are presented. In equation (2), to account for the demographic composition of households I include in a_{ht} the numbers of adult males and females, numbers of male and female children in two age groups (0 to 4 years old, and 5 to 15 years old), the mean ages of children, the square root of the mean ages of children. Z_h contains a number of village(2), household caste(2) and time(5) dummy variables, in addition to a measure of permanent income of the household over the sample period.

Table 2 presents the estimation results for 4 equations. I first analyse the levels-version results: in equation (2.1) there are four children groups and equation (2.2) is a restricted version of (2.1). The most important thing to note in these two equations is the significant positive effect for all the male groups. Female children in the age group 0-4 do not have any significant effect on food expenditures in (2.1), and in (2.2) when female children are aggregated, they do not have any effect. Table 4 presents the F-test results for equality of gender effects in the levels and fixed effects equations for food expenditures. In (2.1) there is a significant difference between male and female children in the 0-4 group [$F(1,567)=3.96$, $p=0.044$], but not for the 5-15 age group. However, the overall difference is significant in (2.2) [$F(1,569)=3.74$, $p=0.051$]. This result may support Behrman's (1988) finding based on the ICRISAT nutrition survey[10] that female children on average get less nutrients than boys (during lean seasons). But one must always be cautious in interpreting the result obtained here: it does not imply directly that girls get fewer nutrients than boys, but it does reveal that girls do not have any significant effect on food expenditures.

In both the equations, the difference between adult males and adult females is strongly significant[11]. Most of the other variables are significant in (2.1) and (2.2): the income elasticity is around 0.18 (a 10% increase in income leads to a 1.8% increase in food expenditures) and the permanent income variable is also strongly significant. Of the age variables, both the male children age variables are significant. The village dummies are also significant[12].

In the first two columns of Table 2, there is no control for the unobserved household fixed effect, α_h, which is characterized as the parents' marginal utility of wealth. Columns 3 and 4 of Table 2 present the fixed effects estimates which control for the fixed effects by estimating the model in deviation form (or, the within-estimator approach). In both (2.3) and (2.4), the household fixed effects are significant: in (2.3), the F test value is 1.96 and in (2.4) it is 1.94 - these test values were obtained by estimating an equation with all the variables presented in Table 2 (except permanent income, which is time-invariant) and 98 household dummies. This clearly shows the importance of controlling for the unobserved household specific effect, over and above including permanent income of the household and other fixed variables, which may bias the coefficients in the levels equations. Once allowance is made for fixed effects, the impact of the household composition variables is reversed.

In equations (2.3) and (2.4), no male children group has any significant effect on food consumption, with the only significant effect being that of female children in the 5-15 group. The F-test results presented in Table 4 show that there is no difference between male and female children, with controls for fixed effects: the bias in favour of male children, which is

present in the levels equations, vanishes with control for the unobserved household fixed effect. If the household fixed effect is not controlled for, one would conclude, as in most of the literature, that parents have a pro-male bias in the intra-household allocation of food. But the results here clearly suggest that, with appropriate controls for the wealth-adjustments that parents make, there is no gender-bias in the intra-household allocation of food over and above the impact of such an intertemporal adjustment. There is no significant difference between adult male and female groups. The male age coefficients are significant and income is still highly significant; however, the effects of the time-invariant variables cannot be observed in the fixed-effects version.

In order to test the hypothesis that parents may be forced to reduce total household expenditures (hence, food expenditures), I have estimated the above equations with total expenditure as the dependent variable. The estimation results are presented in Table 3 and the F-test results are presented in Table 5. There seems to be some support for this hypothesis, atleast for young children. In the levels equations, there is no significant difference between adult males and females. But in the case of young children, male children significantly increase total expenditures whereas female children do not have any effect and there is a significant difference between them [$F(1,567)=3.41$, $p=0.061$]. However in the case of older children, female children significantly increase expenditures but male children do not have any effect. The income elasticity here is around 0.16, and many of the fixed variables are significant. As in the case of the food expenditure equations, the results change in this case also when we control for fixed effects. In equation (3.3), both the adult variables are significant and so is the female children (5-15) group. Young male

children are no longer significantly different from young female children, with control for fixed effects.

5. Summary and Conclusion

In this paper, I examine the issue of gender-bias in intra-household allocation of resources from the perspective of the modern theories of intertemporal allocation. The empirical analysis is based on a panel of household level consumption data from India. Several Engel curve relationships are estimated, with household income as the first explanatory variable, to determine gender patterns in consumption. The levels-version results of this paper are in line with the findings in the literature that parents favour boys over girls in allocation of resources[13].

Based on the assumption that households seek to equalize the marginal utility of expenditures when they allocate resources, I model the parental marginal utility of wealth as the unobserved household-specific fixed effect that stays constant over time. If parents optimally allocate resources over the life-cycle, then they would reduce consumption expenditure (and increase savings) following the birth of a female child because female children increase the marginal utility of wealth[14]. The fixed effects estimation results, based on this rationale, indicate that, once the unobserved household fixed effect is controlled there is no evidence of any significant gender-bias in the intrahousehold allocation of food and other resources. These results point out that the bias against female children in the intra-household allocation of resources derives entirely from the presence of the unobserved fixed effect.

Table 1 : Descriptive Statistics for ICRISAT Households, 1976-81[a]

Variables	Mean	SD
Food expenditure[b]	3166.00	1523.00
Log of food expenditure	7.95	0.46
Total expenditure	4617.00	2346.00
Log of total expenditure	8.32	0.47
Total household income	6188.33	5754.93
Number of adult males	1.77	0.98
Number of adult females	1.75	0.96
Number of male children,0-4	0.39	0.67
Number of female children,0-4	0.30	0.56
Number of male children,5-15	0.99	0.92
Number of female children,5-15	0.79	0.89
Household Size	5.99	2.78
Mean age of Male Children	5.98	4.69
Mean age Female Children	5.09	4.89

a. Number of observations:594.
b. All values are in 1983 rupees.

Notes:

(1) Total household income is the sum of: net trade income, net crop income, net livestock income, net land rent, salary and wage incomes.

(2) Food includes also edible oils and fats. Non-food expenditures include: narcotics, tea, coffee, tobacco, pan, alcohol, clothing, tailoring expenses, chappals&footwear, medicines, cosmetics, soap and barber service, travel and entertainment, electricity, water charges, cooking fuel, labour expenses for domestic work, other expenses.

Table 2 : Food Expenditure Equation - Levels and Fixed Effects Estimates for the ICRISAT Data:1976-81
(Dependent variable:Log of real food expenditure)[a,b]

Variables	2.1 (Levels)	2.2 (Levels)	2.3 (Fixed Effects)	2.4 (Fixed Effects)
Males(>15)	0.1021	0.0998	0.0844	0.0840
	(0.0138)	(0.0135)	(0.0306)	(0.0297)
Females(>15)	0.0356	0.0355	0.0868	0.0846
	(0.0150)	(0.0148)	(0.0243)	(0.0233)
Males(0-4)	0.0811	--	0.0353	--
	(0.0233)		(0.0261)	
Females(0-4)	0.0132	--	0.0269	--
	(0.0272)		(0.0317)	
Males(5-15)	0.0457	--	0.0373	--
	(0.0186)		(0.0302)	
Females(5-15)	0.0436	--	0.0660	--
	(0.0194)		(0.0309)	
Males(0-15)	--	0.0628	--	0.0288
		(0.0147)		(0.0200)
Females(0-15)	--	0.0221	--	0.0408
		(0.0160)		(0.0254)
Log real income	0.1845	0.1845	0.1631	0.1641
	(0.0281)	(0.0280)	(0.0226)	(0.0227)
Log perm income	0.1813	0.1837	--	--
	(0.0351)	(0.0351)		
Mean age of male children	0.0261	0.0223	0.0303	0.0276
	(0.0117)	(0.0103)	(0.0156)	(0.0149)
Sqrt(mean age of male children)	-0.0727	-0.0671	-0.1034	-0.0913
	(0.0426)	(0.0398)	(0.0610)	(0.0596)
Mean age of fem children	-0.0042	-0.0016	0.0215	0.0258
	(0.0119)	(0.0103)	(0.0167)	(0.0160)
Sqrt(mean age of fem children)	0.0058	0.0075	-0.0874	-0.0873
	(0.0429)	(0.0390)	(0.0633)	(0.0616)
Constant	4.2963	4.2716	--	--
	(0.1932)	(0.1909)		
R-squared(adj)	0.6796	0.6805	0.1930	0.1919
N	589	589	589	589

F(98,479) - test for household (vs.no) fixed effects (equation 2.1) = 1.96, significant at 1% level

F(98,481) - test for household (vs.no) fixed effects (equation 2.2) = 1.94, significant at 1% level

a. Standard errors in parentheses.
b. All the other time-invariant coefficients are reported in Table 6.

Table 3 : Total Expenditure Equation - Levels and Fixed Effects Estimates for the ICRISAT Data:1976-81
(Dependent variable:Log of real total expenditure)[a,b]

Variables	3.1 (Levels)	3.2 (Levels)	3.3 (Fixed Effects)	3.4 (Fixed Effects)
Males(>15)	0.0794	0.0809	0.0636	0.0686
	(0.0136)	(0.0134)	(0.0295)	(0.0286)
Females(>15)	0.0439	0.0422	0.0929	0.0908
	(0.0147)	(0.0146)	(0.0234)	(0.0224)
Males(0-4)	0.0784	--	0.0340	--
	(0.0229)		(0.0251)	
Females(0-4)	0.0165	--	0.0238	--
	(0.0269)		(0.0305)	
Males(5-15)	0.0133	--	0.0014	--
	(0.0183)		(0.0290)	
Females(5-15)	0.0534	--	0.0549	--
	(0.0191)		(0.0297)	
Males(0-15)	--	0.0415	--	0.0107
		(0.0145)		(0.0193)
Females(0-15)	--	0.0267	--	0.0347
		(0.0159)		(0.0245)
Log real income	0.1642	0.1608	0.1365	0.1336
	(0.0277)	(0.0277)	(0.0217)	(0.0218)
Log perm income	0.2303	0.2321	--	--
	(0.0346)	(0.0348)		
Mean age of male children	0.0172	0.0085	0.0212	0.0134
	(0.0115)	(0.0102)	(0.0150)	(0.0143)
Sqrt(mean age of male children)	-0.0301	-0.0132	-0.0632	-0.0397
	(0.0420)	(0.0394)	(0.0587)	(0.0574)
Mean age of fem children	-0.0004	0.0015	0.0125	0.0167
	(0.0117)	(0.0102)	(0.0161)	(0.0155)
Sqrt(mean age of fem children)	0.0146	-0.0083	-0.0508	-0.0550
	(0.0423)	(0.0387)	(0.0609)	(0.0593)
Constant	4.4479	4.4598	--	--
	(0.1901)	(0.1893)		
R-squared(adj)	0.7099	0.7067	0.1662	0.1637
N	589	589	589	589

F(98,479) - test for household (vs.no) fixed effects (equation 3.1) = 2.24, significant at 1% level

F(98,481) - test for household (vs.no) fixed effects (equation 3.2) = 2.30, significant at 1% level

a. Standard errors in parentheses.
b. All the other time-invariant coefficients are reported in Table 6.

Table 4 : F-test Results for Gender Equality in Food Expenditure Equations[a]

Variable	2.1 (Levels)	2.2 (Levels)	2.3 (Fixed Effects)	2.4 (Fixed Effects)
Adults	7.980	7.730	0.000	0.000
	(0.005)	(0.006)	(0.913)	(0.937)
Children (0-4)	3.960	--	0.040	--
	(0.044)		(0.827)	
Children (5-15)	0.010	--	0.038	--
	(0.895)		(0.547)	
Total Children	2.010	3.740	0.370	0.110
	(0.135)	(0.050)	(0.689)	(0.734)
Adults and Children	3.880	5.670	0.260	0.060
	(0.009)	(0.004)	(0.857)	(0.943)

a. Numbers in parentheses are the p-values.

Table 5 : F-test Results for Gender Equality in Total Expenditure Equations[a]

Variable	3.1 (Levels)	3.2 (Levels)	3.3 (Fixed Effects)	3.4 (Fixed Effects)
Adults	2.360	2.850	0.390	0.250
	(0.066)	(0.088)	(0.541)	(0.626)
Children (0-4)	3.410	--	0.060	--
	(0.062)		(0.795)	
Children (5-15)	2.450	--	1.410	--
	(0.114)		(0.233)	
Total Children	3.480	0.500	1.230	0.490
	(0.031)	(0.486)	(0.294)	(0.493)
Adults and Children	3.240	1.660	0.840	0.300
	(0.022)	(0.191)	(0.476)	(0.744)

a. Numbers in parentheses are the p-values.

Table 6 : Food Expenditure and Total Expenditure Equations - Levels Estimates for the ICRISAT Data:1976-81
(Time invariant control variables)[a]

Variables	2.1 (Food Exp. equations)	2.2	3.1 (Tot. Exp. equations)	3.2
Dummy(Village3)[b]	0.3034	0.3069	0.3750	0.3761
	(0.0279)	(0.0277)	(0.0275)	(0.0275)
Dummy(Village5)	0.1183	0.1266	0.2333	0.2461
	(0.0286)	(0.0282)	(0.0283)	(0.0280)
Dummy(1976)[c]	-0.0104	-0.0100	-0.0361	-0.0353
	(0.0387)	(0.0386)	(0.0381)	(0.0383)
Dummy(1977)	-0.0125	-0.1033	-0.0840	-0.0828
	(0.0384)	(0.0382)	(0.0377)	(0.0379)
Dummy(1978)	-0.0037	-0.0008	-0.0579	-0.0560
	(0.0378)	(0.0377)	(0.0372)	(0.0374)
Dummy(1979)	0.1575	0.1611	0.1074	0.1112
	(0.0376)	(0.0375)	(0.0369)	(0.0372)
Dummy(1980)	0.1787	0.1803	0.1175	0.1190
	(0.0377)	(0.0376)	(0.0372)	(0.0372)
Low Caste[d] Dummy	0.0446	0.0406	0.0179	0.0044
	(0.0372)	(0.0364)	(0.0366)	(0.0361)
Medium Caste Dummy	0.0136	0.0175	-0.0050	-0.0054
	(0.0288)	(0.0286)	(0.0283)	(0.0283)

a. Standard errors in parentheses.
b. Village 1 is dropped.
c. Year 1981 is dropped.
d. High caste is dropped.

Notes

1. In the Indian case, North-South distinction seems to be important in explaining gender-bias in intra-household allocation of food. See Harriss (1990).

2. The Indian data set used in this study also has a nutrition survey [see Behrman(1988)]. Pitt, Rosenzweig and Hassan (1990) utilize a nutrition survey from Bangladesh.

3. Deaton (1987, 1989), Haddad and Hoddinott (1991) and Subramanian and Deaton (1991) use household level consumption data to look at gender patterns in intra-household allocation.

4. See Miller (1980) for some anthropological evidence on marriage payment practices among propertied and unpropertied classes in India. Here again, considerable regional differences are present.

5. See Browning (1992) for the general approach.

6. Differential returns in the labour market seem to play a crucial role in explaining male-female children survival differentials [see Rosenzweig and Schultz (1982)].

7. See Rosenzweig and Stark(1989) for some evidence on how households engage in consumption smoothing through marriage and migration of daughters.

8. Hsiao (1986) provides a good analysis of panel data estimation methods.

9. Of the total 120 households from the three villages, data are available for 104 households for all the years from 1976 to 1981. Five of these households were dropped from the analysis in this paper: two single person households were not included, and three other households in which all the children were reported to be living outside the household units for the entire length of the panel were also dropped.

10. Based on the same survey, Behrman and Deolalikar (1990) find that females have lower price elasticities of demand for nutrients than males.

11. Deaton (1981)'s results based on Sri Lankan household consumption data do not show any significant gender-bias in the intra-household allocation of food.

12. In another specification, not reported in the paper, I included children-landholding interaction dummies. The results indicate that gender-bias is more pronounced among the landed households than among the landless households. Harriss (1990) reviews several studies which report similar results.

13. Bardhan (1984), Sen and Sengupta (1983) and Harriss (1990) present evidence for intra-household disparities in food allocation in India.

14. More generally, if female children do not make any significant economic contributions to the parents' household in terms of tangible earnings then parents may view the birth of a female child as a wealth-shock. Rosenzweig and Schultz's (1982) results show that parents may allocate resources (in a pure investment sense) on the basis of relative labour market returns to investments in male and female children.

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